

WHAT IS CLAIMED IS:

1. An optical engine which modulates a light ray from a light source in accordance with an image signal and projects a result onto a screen, the optical engine comprising a housing forming a sealed space, there are provided in the housing:

5 a light separation element which separates an incoming light ray from the light source into three primary color light rays;

10 a plurality of reflection type liquid crystal elements which are arranged in such a manner that the respective three primary color light rays enter from the light separation element, and emit reflected light rays modulated by the image signal;

15 a plurality of reflection polarizing plates to which the light rays separated by the light separation element respectively enter, which causes the incoming light rays to enter the respective liquid crystal elements, and transmit therethrough the reflected light rays from the liquid crystal elements; and

20 a combining prism which combines the light rays transmitted through a plurality of the reflection polarizing plates and emits a resultant light ray.

25 2. The optical engine according to claim 1, wherein there are further provided a phase difference plate and a polarizing plate which are respectively arranged in light paths extending from the light

separation element to the respective liquid crystal elements and used to control polarization characteristics of the respective liquid crystal elements.

3. The optical engine according to claim 1,
5 wherein the housing includes an incident opening from which the light ray from the light source enters and an outgoing radiation opening from which the light ray from the combining prism outgoes, a sealed space is formed by closing the incident opening and the outgoing radiation opening by using lens members, and optical elements other than the reflection type liquid crystal elements provided in this sealed space are made of inorganic materials.
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4. The optical engine according to claim 1,
15 wherein the reflection type liquid crystal elements are fixed to radiators integrally attached to the housing, and heat from the radiators is radiated to the outside of the housing.

5. The optical engine according to claim 1,
20 wherein a ventilation path is provided to an intermediate portion of the housing, and one of a plurality of the radiators is provided in the ventilation path.

6. An optical engine which modulates a light ray from a light source in accordance with an image signal and projects a result onto a screen, the optical engine comprising a housing forming a sealed space,
25 wherein there are provided in the housing:

a light separation element which includes a dichroic mirror and a reflection mirrors, and is used to separate an incoming light ray from the light source into R, G and B light rays;

5 a plurality of reflection type liquid crystal elements which are arranged in such a manner that the R, G and B light rays separated by the light separation element respectively enter thereto, and emit reflected light rays modulated by the image signal;

10 a plurality of reflection polarizing plates which are respectively arranged in light paths between the light separation element and the respective liquid crystal elements, to which the R, G and B light rays separated by the light separation element 13 respectively enter, which reflect the incoming light rays to enter the respective liquid crystal elements, and transmit reflected light rays from the liquid crystal elements therethrough; and

15 a combining prism which combines light rays transmitted through a plurality of the reflection polarizing plates and emits a resultant light ray.

20 7. The optical engine according to claim 6, wherein there are provided a phase difference plate and a polarizing plate which are respectively arranged in the light paths extending from the light separation element to the respective liquid crystal elements, and used to control polarization characteristics of the

respective liquid crystal elements.

8. The optical engine according to claim 6,
wherein the housing includes an incident opening from
which the light ray from the light source enters and
5 an outgoing radiation opening from which the light from
the combining prism outgoes, a sealed space is formed
by closing the incident opening and the outgoing
radiation opening by using lens members, and optical
elements except the reflection type liquid crystal
10 elements provided in this sealed space are made of
inorganic materials.

9. The optical engine according to claim 6,
wherein the reflection type liquid crystal elements are
fixed to radiators integrally attached to the housing,
15 and heat from the radiators are radiated to the outside
of the housing.

10. The optical engine according to claim 6,
wherein a ventilation path is provided to an intermediate
portion of the housing, and one of a plurality of
20 the radiators is provided in the ventilation path.

11. A projection type display apparatus
comprising:

a light source;
a housing having an incident opening from which a
25 light ray from the light source enters and an outgoing
radiation opening for the light ray;
a lens which is attached to the housing so as to

close the incident opening and leads the light ray from the light source into the housing;

5 a light separation element which includes a dichroic mirror and a reflection mirror, and is used to separate the light which has entered through the incident opening into R, G and B light rays;

10 a plurality of reflection type liquid crystal elements which are arranged in such a manner that the R, G and B light rays separated by the light separation element respectively enter thereto, and emit reflected light rays modulated by an image signal;

15 a plurality of reflection polarizing plates which are respectively arranged in light paths between the light separation element and the respective liquid crystal elements, to which the R, G and B light rays separated by the light separation element respectively enter, which reflect the incoming light rays to enter the respective liquid crystal elements, and transmit reflected light rays from the liquid crystal elements therethrough;

20 a combining prism which combines the light rays transmitted through a plurality of the reflection polarizing plates and emits a resultant light ray; and

25 a projection lens which is attached to the outgoing radiation opening of the housing, used to project the light ray from the combining prism,

wherein optical elements including the light

separation element, the reflection type liquid crystal elements, the reflection polarizing plates and the combining prism are arranged in the housing.

12. The projection type display apparatus
5 according to claim 11, wherein the optical elements except the reflection type liquid crystal elements arranged in the housing are made of inorganic materials.

13. The projection type display apparatus
10 according to claim 11, wherein the reflection type liquid crystal elements are fixed to radiators integrally attached to the housing, and heat from the radiators are radiated to the outside of the housing.